Astronomy

ES-2 The student will demonstrate an understanding of the structure and properties of the universe.

ES-2.5 Classify stars by using the Hertzsprung-Russell diagram.
Taxonomy level: 2.3-B Understand Conceptual Knowledge

Previous/future knowledge: The Hertzsprung-Russell diagram and its use as a classification tool for stars is a new concept for this course; it has not been presented in any previous grades.

It is essential for students to know that the properties of mass, magnitude/brightness, temperature and diameter of stars are closely related. This relationship has been shown on a chart known as the Hertzsprung-Russell diagram (H-R diagram).

Absolute magnitude	This property of brightness is plotted on the vertical axis of the chart.
Spectral type	This property is found on the lower horizontal axis. Stars are given a letter and number based on the pattern of spectral lines produced by the star and temperature. O stars being the hottest and M stars being the coolest.
Surface temperature	Measured in Kelvin is located along the top horizontal axis. Highest temperatures are on the left to coolest temperatures on the right.

Students will need to use these properties on the axes of the chart to classify stars.

Main sequence	90% of stars, including the Sun, are found along a diagonal that runs from the upper left where hot, bright stars are found to the lower right where cool, dim stars are found. All these stars have similar internal structures and functions.
Giants	These stars are found in the upper right of the chart. They are cool stars with large surface areas that are bright, so they are called red giants.
Dwarfs	Dim, hot stars are plotted in the lower left corner. They are small or they would be brighter. These are called white dwarfs.

It is not essential for students to classify individually named stars, but understanding the meaning of the placement of a star on the chart is necessary.

Assessment Guidelines:
The objective of this indicator is to *classify* stars through the use of the Hertzsprung-Russell diagram; therefore, the primary focus of assessment should be to place stars into a classification according to the properties shown on the diagram.
In addition to classify appropriate assessments may require students to:

- *interpret* the chart as to the meaning of the factors on the horizontal and vertical axes;
- *exemplify* stars found in various locations on the chart; or
- *identify* the classification of the Sun based on the H-R diagram.